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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,291	07/31/2003	Renato Keshet	200308995-1	5072

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EXAMINER

PATEL, KANJIBHAI B

ART UNIT	PAPER NUMBER
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2624

DATE MAILED: 11/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/632,291	Applicant(s) KESHET ET AL.	
	Examiner Kanji Patel	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8,10-13,15-18 and 20-26 is/are rejected.
- 7) ☒ Claim(s) 9,14,19,27 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>7/31/03, 9/29/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. Information Disclosure Statement submitted on 7/31/03 and 9/29/03 have been considered by the examiner.

Drawings

2. Drawings filed 7/31/03 have been approved by the examiner.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-7, 10-12, 15-17 and 20-26 are rejected under 35 U.S.C. 102(e) as being anticipated by Kokarala et al. (US 7,088,392 B2).

For claim 1, Kokarala et al. disclose a digital imaging system (Figure 1) comprising:

an imaging system configured to provide image data of an image (column 4 line 57 to column 5 line 10), the image data comprising digital image data for a plurality of pixel locations (in Figure 2, 25a-25c provide red green and blue pixel locations); and processing circuitry (in Figure 1, digital signal processor 40 provides a processing circuitry; also Figures 2-3 show a details of demosaicing process) configured

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to process the image data provided by the imaging system to denoise (column 15, lines 15-61) and sharpen (column 15 line 62 to column 16 line 46) the image data, wherein the processing circuitry, for an individual one of the pixel locations, is configured to:

identify a respective subset of the image data corresponding to the one pixel location (column 15, lines 15-61; a 3x3 filter or a Bayer pattern provides a subset and a center pixel 4 or G2 provides a pixel location); and

perform a single processing operation (a demosaicing algorithm shown in Figures 2-3 performs a single processing operation) using the image data of the identified subset of the image data to denoise (column 15, lines 36-61) and sharpen (column 15 line 62 to column 16 line 46) the image data of the individual one pixel location.

For claim 2, Kakarala et al. disclose the system of claim 1 wherein the processing circuitry (40) is configured to perform the single processing operation (demosaicing) using a robust estimation filter (a combination of a smoothing operation provided in Figures 6B and a sharpening operation provided in Figure 7 corresponds to a robust estimation filter).

For claim 3, Kakarala et al. disclose the system of claim 1 wherein the processing circuitry (40) is configured to perform the single processing operation using a robust estimation filter without division operations (column 3, lines 56-60; no use of division).

For claim 4, Kakarala et al. disclose the system of claim 1 wherein the processing circuitry (40) is configured to perform the single processing operation using

the image data comprising information regarding a plurality of colors at individual ones of the pixel locations (column 5, lines 1-10; see also Figure 2; red, green and blue pixels).

For claim 5, Kakarala et al. disclose the system of claim 1 wherein the processing circuitry (40) is configured to perform the single processing operation using the image data comprising luminance information (steps 330, 350 in Figure 3).

For claim 6, Kakarala et al. disclose the system of claim 1 wherein the processing circuitry (40) is configured to identify the respective subset (3x3 filter or a Bayer pattern provides a subset) of the image data comprising image data of a plurality of other pixel locations (; column 15 line 35 to column 16 line 16; Figure 2).

For claim 7, Karakala et al. disclose a digital imaging system (Figure 1) comprising:

imaging means (20 in Figure 1 is an imaging means) for providing image data of an image (raw data in Figure 1), the image data comprising digital image data for a plurality of pixel locations (25, 25a-25c in Figure 2 provide red, green and blue pixel locations); and

processing means (digital signal processor 40 in Figure 1 is a processing means) for denoising (column 15, lines 15-61) and sharpening (column 15 line 62 to column 7 line 46) the image data of the pixel locations comprising for an individual one of the pixel locations:

identifying a respective subset of the image data comprising image data of the one pixel location and image data of at least one other pixel location (column 15, lines

15-61; a 3x3 filter or a Bayer pattern provides a subset and a center pixel 4 or G2 provides a pixel location); and

processing the image data of the one pixel location and the other pixel location using a robust estimation filter to at least one of sharpen (column 15 line 62 to column 7 line 46) and denoise (column 15, lines 15-61) the image data of the one pixel location (a combination of a smoothing operation provided in Figures 6B and a sharpening operation provided in Figure 7 corresponds to a robust estimation filter).

For claims 10, and 15, Karakala et al. disclose the system of claim 7 wherein the processing comprises processing the image data after demosaicing operations (column 15, lines 15-18; adaptive smoothing process can be performed prior to or after the interpolation operation).

For claims 11 and 16, Karakala et al. disclose the system of claim 7 wherein the processing the image data comprising processing the image data comprising luminance (steps 330, 350 in Figure 3) information.

For claim 12, see at least the rejection of claim 7 above.

For claim 20, Karakala et al. disclose the method of claim 17 wherein the processing comprises processing in a single processing operation (Figure 2-3; demosaicing processing is a single processing operation).

For claim 21, Karakala et al. disclose the method of claim 17 further comprising demosaicing (Figures 2-3) the image data, and the processing comprises processing after the demosaicing (column 15, lines 15-18; adaptive smoothing process can be performed prior to or after the interpolation operation).

For claim 22, Karakala et al. disclose the method of claim 17 wherein the providing image data comprises providing image data comprising a plurality of colors for individual ones of the pixels (column 5, lines 1-10; Figure 2).

For claim 23, Karakala et al. disclose the method of claim 17 wherein the image data comprises chrominance and luminance information (Figure 3), and wherein the sharpening (Figure 7) and denoising (Figure 6B) comprise sharpening and denoising only the luminance information (steps 330, 350).

For claim 24, Karakala et al. disclose the method of claim 17 wherein the processing comprises adjusting image data of one of the pixel locations using image data of at least one other pixel location (column 15, lines 36-61).

For claim 25, Karakala et al. disclose the method of claim 24 wherein the adjusting comprises adjusting to denoise (Figure 6B) the image data responsive to a difference (step 330 in Figure 3) of the image data of the one and the other pixel locations being less than a threshold (step 670 in Figure 6B) and adjusting to sharpen (Figure 7) the image data responsive to a difference of the image data being greater than the threshold.

For claim 26, Karakala et al. disclose the method of claim 25 wherein the adjusting to sharpen the image data comprises adjusting responsive to a difference of the image data being less than another threshold (column 13, lines 25-30).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 8, 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakarala et al. (US 7,088,392 B2) as applied to above claims and further in view of Tomasi et al. (Bilateral filtering of gray and color images--IDS).

Regarding claims 8, 13 and 18, Kakarala et al. do not disclose a use of a bilateral filter as claimed in the invention. However, applicant's disclosed prior art to Tomasi et al. disclose a bilateral filter (abstract; paragraph 2). Such a bilateral filtering smoothes images while preserving edges, by means of a nonlinear combination of nearby image values. It combines gray levels or colors based on both their geometric

closeness and their photometric similarity, and prefers near values to distant values in both domain and range. Kakarala et al. and Tomasi et al. are combinable because they both deal in the same field of image smoothing and sharpening or preserving the edges of the images. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kakaral et al. by including the bilateral filter as taught by Tomasi et al. because such a modification will not produce phantom colors along edges in color images, and reduces phantom colors where they appear in the original image as mentioned by Tomasi et al. in the abstract.

Allowable Subject Matter

5. **Claims 9, 14, 19 and 27** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Prior art fails to teach or fairly suggest, singly or in combination, a robust estimation filter comprising a bilateral filter without division operations as stipulated in claims 9, 14 and 19.

Prior art fails to teach or fairly suggest, singly or in combination, applying square root operations to the image data of the one pixel location and the image data of the other pixel location before the adjusting as stipulated in claim 27.

Other prior art cited

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Jaspers (US 7,081,919) discloses a green reconstruction for image sensors.

Kakarala (US 7,015,961 B2) discloses a digital image system and method for combining demosaicing and bad pixel correction.

Jones (US 6,924,841 B2) discloses a system and method for capturing color images that extends the dynamic range of an image sensor using first and second groups of pixels.

Hel-or et al. (US 6,404,918 B1) disclose an image demosaicing method utilizing directional smoothing.

Maurer et al. (US 6,731,821 B1) disclose a method for enhancing compressibility and visual quality of scanned document images.

Berkner (US 7,068,851 B1) discloses a multiscale sharpening and smoothing with wavelets.

Maurer (US 6,665,448 B1) discloses a selective smoothing and sharpening of images by generalized unsharp masking.

Hunter et al. (US 7,071,978 B2) disclose an image mosaic data reconstruction.


Olding et al. (US 6,970,597 B1) disclose a method of defining coefficients for use in interpolating pixel values.

Contact Information

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kanji Patel whose telephone number is (571) 272-7454. The examiner can normally be reached on Monday to Friday from 7:30 a.m. to 5:00 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bella, Matthew can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kanji Patel
Art Unit 2624
11/10/06


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PRIMARY EXAMINER